IERA-RS-BR-TR-2000-0009

UNITED STATES AIR FORCE
IERA

Records of Aedes Mosquitoes Collected in the United States Air Force Ovitrapping Program – CY 2000

Chad P. McHugh

December 2000

Air Force Institute for Environment, Safety and Occupational Health Risk Analysis
Risk Analysis Directorate
Risk Assessment Division
2513 Kennedy Circle
Brooks Air Force Base TX 78235-5123

NOTICES

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely Government-related procurement, the United States Government incurs no responsibility or any obligation whatsoever. The fact that the Government may have formulated or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication, or otherwise in any manner construed, as licensing the holder or any other person or corporation; or as conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

The mention of trade names or commercial products in this publication is for illustration purposes and does not constitute endorsement or recommendation for use by the United State Air Force.

The Office of Public Affairs has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nationals.

This report has been reviewed and is approved for publication.

Government agencies and their contractors registered with Defense Technical Information Center (DTIC) should direct requests for copies to: Defense Technical Information Center, 8725 John J. Kingman Rd., STE 0944, Ft. Belvoir, VA 22060-6218.

Non-Government agencies may purchase copies of this report from: National Technical Information Services (NTIS), 5285 Port Royal Road, Springfield, VA 22161-2103.

C. P. McHugh

CHAD P. McHUGH, MPH, PhD
Entomologist

Kenneth L. Cox

KENNETH L. COX, Lt Col, USAF, MC, SFS
Chief, Risk Assessment Division

REPORT DOCUMENTATION PAGE	Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 2000	Interim 1 Jan 00 - 31 Dec 00

4. TITLE AND SUBTITLE
Records of *Aedes* Mosquitoes Collected in the United States Air Force Ovitrapping Program - CY 2000

5. FUNDING NUMBERS

6. AUTHOR(S)
Chad P. McHugh

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Institute for Environment, Safety and Occupational Health Risk Analysis
Risk Analysis Directorate
Risk Assessment Division
2513 Kennedy Circle
Brooks Air Force Base TX 78235-5123

8. PERFORMING ORGANIZATION REPORT NUMBER
IERA-RS-BR-TR-2000-0009

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
Prepared in cooperation with Ms. Sarah Howell

12a. DISTRIBUTION AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*
During CY 2000, a total of 619 oviposition paddles were submitted to AFIERA/RSRH by 13 USAF installations in CONUS. Container-breeding *Aedes* mosquitoes were detected at almost all installations where surveillance was conducted. Because these mosquitoes are serious pests and may transmit pathogenic viruses, all installations in the eastern half of CONUS should include ovitraps in their surveillance programs.

14. SUBJECT TERMS
CONUS, oviposition traps, ovitraps, *Aedes, aegypti, albopictus, japonicus, triseriatus,* arbovirus, West Nile virus, La Crosse, dengue, mosquito, container

15. NUMBER OF PAGES
14

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF TABLES

RECORDS OF *AEDES* MOSQUITOES COLLECTED IN THE U.S. AIR FORCE OVITRAPPING PROGRAM - CY 2000

SUMMARY

During CY 2000, a total of 619 ovipaddles was submitted to AFIERA/RSRH by 13 USAF installations in CONUS. Container-breeding *Aedes* mosquitoes were detected at almost all installations where surveillance was conducted. Because these mosquitoes are serious pests and may transmit pathogenic viruses, all installations in the eastern half of CONUS should include ovitraps in their surveillance programs.

INTRODUCTION

While many mosquitoes fly and bloodfeed at night, some of our most medically-important species are day-flying, day-feeding mosquitoes. Since light traps which operate at night will not effectively sample day-flying mosquitoes, an alternative sampling method, the oviposition trap, is used. Gravid females are lured to the ovitrap, a container partially filled with water, and lay their eggs on a tongue depressor covered with paper toweling. The presence of eggs on the paper-covered tongue depressor (aka ovipaddle) is an indirect indicator of adult mosquito activity, and the percentage of positive ovipaddles is an index of mosquito abundance.

In CONUS, four species of container-breeding *Aedes* commonly are collected in oviposition traps. *Aedes aegypti*, the yellow fever mosquito, is an Old World species that was probably introduced into this country by early European settlers. This is a peridomestic mosquito that depends largely on human activity for its breeding habitat, and it is a vector for urban yellow fever and dengue. An eradication program in the 1950s and 1960s reduced, but did not eradicate, this species from the Americas. When control efforts were relaxed in the 1970s, mosquito populations rebounded and the incidence of dengue began to increase. Populations in CONUS declined again coincident with introduction of *Aedes albopictus* in the 1980s, but it is still present, primarily in south Florida and south Texas and recently was found in Tucson, AZ (Engelthaler et al. 1997).

Aedes albopictus, the Asian tiger mosquito, was probably introduced into Hawaii late in the last century and discovered in CONUS in Houston, TX in 1985 (Sprenger and Wuithiranyagool 1986). Importation of used tire casings infested with mosquito eggs from northern Japan is believed to be the mode of entry into CONUS. It spread rapidly and can now be found throughout the southeastern and eastern CONUS as far north as Chicago, IL, and New Jersey (Moore 1999). In many areas, especially the lower Atlantic and the Gulf Coast states, it has become a very significant pest species.

Another introduced *Aedes*, *Ae. japonicus*, was discovered in New York and New Jersey in 1998 (Peyton et al. 1999). Since that time, *Ae. japonicus* has spread to six other states: Ohio, Maryland, Connecticut, Massachusetts, Pennsylvania, and Virginia.

In addition to being irritating, aggressive biters, *Ae. aegypti*, *Ae. albopictus* and *Ae. japonicus* could become involved in the ecology of endemic viruses such as St. Louis encephalitis virus, eastern equine encephalitis virus and La Crosse encephalitis virus. They are competent vectors of dengue virus and could be involved in transmission should that exotic virus be introduced. This threat is particularly acute along the Texas-Mexico border where there was an outbreak of dengue during 1999. In that epidemic, 18 of 66 human cases of dengue in Texas had no travel history outside the state. The possibility that these species could become involved in the transmission of West Nile virus (WNv) in CONUS also exists. During 2000, WNv was detected in pools of *Ae. albopictus* and *Ae. japonicus* collected in the northeastern US where WNv is now present (CDC 2000).

A fourth *Aedes* commonly collected in oviposition traps, *Aedes triseriatus*, is a vector of La Crosse encephalitis virus. This virus is the most common cause of arboviral encephalitis in CONUS, averaging about 60 human cases per year.

MATERIALS AND METHODS

Ovipaddles submitted to AFIERA/RSRH were examined visually for eggs and, when present, eggs were tentatively identified as *Ae. triseriatus* or *Aedes* (*Stegomyia*) spp. Seven to 10 days after receipt, eggs were hatched in tap water and reared on liver powder to the fourth larval instar or the adult stage for specific identification.

RESULTS

During CY 2000, a total of 619 ovipaddles was submitted to AFIERA/RSRH by 13 USAF installations in CONUS (Table 1). The number of ovipaddles submitted ranged from 2 submitted by Shaw AFB, SC, to 155 submitted by Sheppard AFB, TX. One or more species of *Aedes* were detected at all installations except Laughlin AFB and Randolph AFB in Texas and McChord AFB, WA. In past years, *Ae. albopictus* and *Ae. aegypti* were both present at Laughlin AFB and *Ae. albopictus* was extremely common at Randolph AFB. The reason for the failure to detect these species in 2000 is unclear, but could reflect the lack of sampling effort - only 3 ovipaddles were submitted by Laughlin AFB - or drought conditions which prevailed over much of Texas during the spring and summer of 2000. McChord AFB is outside the known range of the four species mentioned above, and the failure to find the *Aedes* species mentioned is not surprising.

Aedes aegypti was found only at Brooks AFB and Sheppard AFB in Texas. The prevalence was low at both installations. *Aedes albopictus* was collected at eight installations. The prevalence of positive ovitraps ranged from 9.5% at Lackland AFB, TX, Patrick AFB to over 50% at Eglin AFB, FL. Three of bases had prevalence rates above 33%, suggestive of an intense infestation. *Aedes triseriatus* was collected only at Sheppard AFB, TX, and Arnold AFB, TN.

Several installations had eggs that were identified as *Aedes* or *Aedes (Stegomyia)*, but from which no specimens could be reared for specific determination. At installations at which *Ae. albopictus* was present, the identity of the these eggs can be reasonably be inferred to be *Ae. albopictus*. Adding these *Aedes* eggs to the *Ae. albopictus* counts significantly increases the prevalence rates at those bases and indicates that they too have a intense infestation.

TABLE 1. Summary of oviposition traps submitted by CONUS USAF installations during CY 2000.

Installation	N	*Ae. aegypti* No. positive (%)	*Ae. albopictus* No. positive (%)	*Ae. triseriatus* No. positive (%)	Other No. positive (%)
Eglin AFB FL	4	0(0)	2(50)	0(0)	
Columbus AFB MS	11	0(0)	2(18.2)	0(0)	
Pope AFB NC	2	0(0)	0(0)	0(0)	*Aedes* sp. 1(50)
Seymour-Johnson AFB NC	161	0(0)	17(10.6)	0(0)	*Aedes sp. 17(10.6)* *Ae.* (Stegomyia) 3(1.9)
Shaw AFB SC	2	0(0)	0(0)	0(0)	*Aedes* sp. 1(50)
Brooks AFB TX	122	2(1.6)	37(30.3)	0(0)	*Aedes* sp. 3(2.5) *Ae.* (Stegomyia) 14(11.5)
Kelly AFB TX	29	0(0)	10(34.5)	0(0)	*Ae.* (Stegomyia) 4(13.8)
Lackland AFB TX	21	0(0)	2(9.5)	0(0)	*Aedes* sp. 2(9.5) *Ae.* (Stegomyia) 4(19.0)
Laughlin AFB TX	3	0(0)	0(0)	0(0)	
Randolph AFB TX	20	0(0)	0(0)	0(0)	
Sheppard AFB TX	155	1(0.6)	43(27.7)	2(1.3)	*Aedes* sp. 9(5.8) *Ae.* (Stegomyia) 3(1.9)
Arnold AFB TN	84	0(0)	36(42.9)	23(27.4)	*Aedes* sp. 4(4.8) *Ae.* (Stegomyia) 10(11.9)
McChord AFB WA	5	0(0)	0(0)	0(0)	

DISCUSSION

The presence of container-breeding *Aedes* on installations is not only a nuisance, but also a significant medical threat, especially where WNv is present. Oviposition traps are an efficient and cost effective way to detect and monitor infestations of these mosquitoes. Many installations in the range of these mosquitoes, including some in the known or potential range of WNv, have minimal or no surveillance. Without an adequate, ongoing surveillance program, installations may not recognize a problem exists, may delay in taking appropriate control measures, and may not be able to determine the effectiveness of control activities.

CONCLUSIONS AND RECOMMENDATIONS

Installations in the eastern half of CONUS are likely to be infested with one or more of the *Aedes* species mentioned above and should include oviposition traps in their surveillance. For additional information, or advice on mosquito surveillance and control please contact Dr Chad McHugh (DSN 240-6135, comm [210] 536-6135).

REFERENCES

1. Centers for Disease Control and Prevention. 2000. Update: West Nile virus activity -- eastern United States, 2000. MMWR 49: 1044-1047.

2. Englethaler, D.E., T.M. Fink, C.E. Levy and M.J. Leslie. 1997. The reemergence of *Aedes aegypti* in Arizona. Emerg. Infect. Dis. 3: 241-242.

3. Moore, C.G. 1999. *Aedes albopictus* in the United States: current status and prospects for further spread. J. Am. Mosq. Cotrol Assoc. 15: 221-227.

4. Peyton, E.L., S.R. Campbell, T.M. Candeletti, M. Romanowski and W.J. Crans. 1999. *Aedes* (*Finlaya*) *japonicus japonicus* (Theobald), a new introduction into the United States. J. Am. Mosq. Control Assoc. Jun;15: 238-41.

5. Sprenger, D. and T. Wuithiranyagool. 1986. The discovery and distribution of *Aedes albopictus* in Harris County, Texas J. Am. Mosq. Control Assoc. 2: 217-219.